

## FLORA OF PORTO SANTO

By T. D. A. COCKERELL

Porto Santo is one of the Madeira Islands, far out in the Atlantic west of Northern Africa. From the mountains near the eastern end of Madeira it is easy to see Porto Santo, less than thirty miles away. The smaller island was first inhabited, and there is a legend that Madeira was found because it was noticed that clouds persistently hung on the western horizon. The story is not very plausible because on any fine day the rocks of Sao Laurengo, the nearest point of Madeira, are very plainly visible from Porto Santo. The island of Porto Santo is about six and a half miles long, and three miles across at the broadest point. There are several hills or small mountains, the highest having an altitude of 1660 feet. The town (Villa Baleira or Whale Town) is old enough to have once been the residence of Christopher Columbus, whose house is still standing. The island is bare and xerophytic, strongly contrasting with the greater part of Madeira, which is much moister and more covered with vegetation. The whole archipelago is volcanic and the rocky surface is extremely rough. In Porto Santo and the Eastern end of Madeira there is a great deal of sand, containing innumerable fossil land shells of Pleistocene age. In former times, as is clearly indicated by marine soundings, Porto Santo must have been several times larger, yet not so large as Madeira. Fragments of this former extension remain as islets, the largest of which are Lime Island (Ilheo de Baixo) and the Lighthouse Island (I. de Cima). These islets, though nearly all within rifle shot of the main island, have peculiar snails and beetles found nowhere else. Thus on the Ilheo de Cima there occurs in abundance a very distinct and remarkable species of land snail, *Geomitra turricula* Lowe. This may be taken to indicate that for a long period there has been great stability of level. A very slight degree of elevation would have connected Cima with the mainland, and allowed *G. turricula* to pass. A very limited depression would have submerged the islet and destroyed the snails.

To the naturalist Porto Santo is chiefly remarkable for the extraordinary series of endemic land shells. There are 42 native species of helicoid mollusks, (a few now extinct,) as

against 37 for the much larger island of Madeira. These include very diverse forms belonging to a series of genera and sub-genera. Perhaps nowhere else in the world is such a concentration of species of these animals. Marine fossils of Miocene age occur in Porto Santo, but the snail fauna must be older than the Miocene. Its affinities are with the genera of Europe, but however it may have reached the island it has long been isolated. Its history as an insular fauna must surely date from the Eocene or even late Mesozoic.

When we compare the flora with the snail fauna the contrast is extreme. The recorded terrestrial vascular plants, excluding those only in cultivation, number 315 species. Of these, 257



No. 1.—View from Villa Baleira. The conical peak is Pico do Castelo. The double peak, more to the right, is Pico de Facho, the highest point in the island.

are dicotyledons, 48 monocotyledons, 2 gymnosperms, and 8 vascular cryptogams. To this list I can add one more, *Adonis microcarpa* DC. (*cupaniana* Guss.), which I found in a field near the Fonte d' Areia on the north side of the island. I determined it by comparison with specimens at Kew. The genus is new to the Madeira Islands, but it has undoubtedly been introduced. The species is known from North Africa, the Canaries, Portugal, Syria, etc. This flora presents very few endemic elements and these are in general of such a character as to indicate recent

segregation, presumably as recent as the Pleiostocene in most cases. Is there then no Eocene or Mesozoic flora, to correspond with the series of snails? It is perhaps represented by the dragon tree, *Dracaena draco* L., which is now extinct on Porto Santo, though once common. This remarkable plant occurs only in the Madeira and Canary Archipelagoes. Whether the Porto Santo form differed from that of Madeira in any small particulars, we shall never know. Whatever plants there might be, whose isolation dated as far back as that of the snails, might be expected to be woody, either trees or shrubs. One such might be *Sideroxylon marmulano* Lowe,\* a Sapotaceous shrub peculiar to the Madeira Islands, and now very rare. Mr. A. C. de Noronha detected it on the I. de Cima, Porto Santo, but it was originally described from various places on the Island of Madeira. The remarkable thing about it is, that it belongs to a tropical and subtropical group according to present day distribution. On looking at the geological record, however, we find that in mid-tertiary times the genus existed in central Europe (*S. putterlicki* Unger), and a related species has been described by Berry from the Eocene of Tennessee. It appears, however, that the really ancient flora has almost totally disappeared, the snails have survived in abundance where the plants could not. The endemic or precinctive plants are few and not specially remarkable. I find the following recorded:

(1.) *Fumaria laeta* Lowe, an annual which is so near to *F. muralis* that Lowe at first described it as a variety. It was found on the summit of the Pico de Facho, the highest point on the island, and it is possible that the seed of its ancestor was conveyed hither by birds. On the top of the same peak was found a small European snail, *Balea perversa*, which ordinarily inhabits trees, and is known to have very adhesive slime. It seems undoubtedly to be carried from tree to tree by birds, and I do not doubt that it reached Porto Santo, where it is a quite isolated type, on the feet of migrating birds. The central European Coccid *Ortheziola vej dovskyi* Sulc which I found on grass roots on the Portella Pass in Madeira, may be supposed to have come in a similar manner, the young larvae clinging to a bird. In J. Y. Johnson's list of Madeira birds, no less than 70 species are given as visitors or stragglers to the islands.

\* Misspelled in various works mermulana and mirmulans.

(2.) *Cheiranthus arbuscula* Lowe, a shrubby species with lilac flowers, related to two species found in Madeira. Webb and Berthelot placed plants of this type in a genus *Dichroanthus*, the name evidently from the fact that in some of them the flowers change color.

(3.) *Lotus floridus* (Lowe) Masf., with f. *sulphurea* (Lowe) having the flowers pale sulphur or straw color instead of orange and brown as in the type. I saw only the typical form which occurs in abundance. This is a silky gray or villous plant now usually regarded as a local form of *L. glaucus* Aiton of Madeira.



No. 2.—View from Villa Baleira, showing two date palms. The palms do not bear edible fruit on the Madeira group. The island near the center is Ilheo de Cima, on which the light-house stands.

Lowe found *L. glaucus* in one place on Porto Santo, and also an intermediate form. It has latterly been assumed that *floridus* is only a xerophytic stage of *glaucus*, but the fact seems to need experimental demonstration. Lowe's intermediate may have been a hybrid, and it is significant that at least some *glaucus* retained its characters in Porto Santo. *L. floridus* occurs also on the islets Cenouras and Nordeste, off Porto Santo.

(4.) *Lotus loweanus* Webb, flowers dark dull blackish purple. The Index Kewensis gives this only from the Canaries, but this is a mistake. It is peculiar to Porto Santo, where it was discovered by Webb and Lowe in 1828.



(5.) *Saxifraga portosanctana* Boiss. Related to *S. maderensis* Don., from Madeira, but perhaps even more closely to *S. cuneata* Willd. from the Iberian Peninsula.

(6.) *Galium geminiflorum* Lowe, a small annual closely related to one described from the Grecian Archipelago.

(7.) *Limonium pyramidatum* (Lowe, as *Statice*). So close to *L. ovalifolium* (Poir.) O. Ktze. that Menezes treats it as a variety. It is however the only *Limonium* in the archipelago, though *Statice maderensis* (Lowe as *Armeria*) occurs in Madeira.

Not one of these seven endemics could be suspected of belonging to the really ancient flora, and all may be supposed to have been derived from ancestors which came across the sea, the seeds perhaps carried by birds. They may date from the Pleistocene, or at the earliest Pliocene, I should suppose.

The Azores have nearly 40 species of endemic vascular plants, but not one of these belongs to any one of the genera represented by the Porto Santo endemics. This may be explained by the rare and accidental character of the introductions providing the stock from which these plants developed.

The three Desertas islands, in plain sight from Porto Santo, have 138 species of vascular plants, with 113 dicotyledons, 20 monocotyledons (all grasses except a *Carex* and an *Asphodelus*), 3 ferns and a *Selaginella*. Two of the ferns are the common brake and maiden hair. The little flat island called Chão, the northernmost of the group, has 1 endemic species, the grass *Lolium loliaceum* (*Arthorchortus loliaceus* Lowe, *Lolium lowei* Menezes). The southern Deserta, called Bugio, is the only known locality for *Chrysanthemum* (*Argyranthemum*) *haematomma* Lowe. Thus the two endemics of the Desertas are of different genera from those of Porto Santo and also from all the endemics of the Azores.

When we catalogue the Porto Santo flora, deriving our data from the excellent "Flora do Archipelago da Madeira" by C. A. de Menezes (1914), it becomes very evident that a large proportion of the species now existing there consists of introduced weeds, or cultivated plants run wild. One gets the impression that all the "tramp" plants of southern Europe are there. Going through the list I find about 160 species (out of a total of 316) which may I think certainly be referred to this category, and perhaps 20 or 30 others might be included. But this

statement is inadequate to convey the correct impression, for the dominance in individuals of these "tramps" certainly far exceeds their numerical proportion as species. The most barren locality I found was the top of the Lime Island (Baixo), where even the xerophytic *Artemisia argentea* L'Herit, so characteristic of the I. de Cima, seems to be wholly absent. A group of nettles (*Urtica membranacea* Poir.) afforded food for the larvae of the beautiful butterfly *Pyrameis indica occidentalis* Feld.

On the dangerous cliffs of the west side, Miss Nancy Paterson, a member of our party, found the typical red-flowered *Anagallis arvensis* L., a matter of interest since the ordinary form throughout Porto Santo and Madeira is the blue-flowered *A. caerulea* Schreb. Here and there, on the top of Baixo, is a sorry-looking plant of *Nicotiana glauca* Graham; but our guide Juan de Pico explained that he had introduced the species there several years ago. On the north slope of the Pico do Castello, on the main island of Porto Santo, we found the only orchid, *Gennaria diphylla* (Lk.) Parl, in good flower. It appears to be truly native but the minute seeds were probably brought by birds in comparatively recent times.\* The top of Pico do Castello is planted with trees (especially *Pinus pinaster* Sol.), which are tended with some care under the impression that they will produce rain. Tamarisk (*Tamarix gallica* L.), though not cited for Porto Santo by Menezes, is abundantly planted about the town and along the sea front, where it doubtless has utility in controlling the drifting sands. There is great need for a really good xerophytic fuel-plant and I believe that the introduction of the mesquite (*Prosopis*) would be a great boon to the inhabitants. The species of *Mesembryanthemum* (*crystallium* L., *nudiflorum* L., *edule* L.) are very conspicuous everywhere. Sometimes when hunting snails I would inadvertently kneel on one of these plants; it was as if I had kneeled in a pool of water. The reader will perceive that there are several things to remind one of Southern California, and indeed we often thought of the resemblance.

My wife and I were two weeks in Porto Santo, during which time we were entirely cut off from the rest of the world. There

\* No one has been able to point out any distinctive peculiarities in the Porto Santo form, but I do not know whether it has been critically investigated. I have placed specimens in the U. S. National Museum.

is no means of communication by telegraph or wireless, and the town, Villa Baleira, seems to be little altered from the time when Columbus walked its streets and married the daughter of the governor. Only Portuguese is spoken, and we should have had a difficult time but for our friend Miss Nancy Paterson, the daughter of the Scotch minister in Funchal, who has an intimate knowledge of the language, the island and the people. With her assistance we were able to secure an excellent guide, and boat-crews to take us to the various islets. We found the people most friendly, and left them with regret. Owing to the magnificent bathing beach (something that Madeira lacks) there is now much talk of building a fashionable hotel for summer tourists. Very likely a few years will see a complete change in the character of the place, and though prosperity may come thereby, something will be lost, which we—and Columbus—loved in our time.

## ADDITIONAL OCCURRENCES OF PLEISTOCENE PLANTS

BY EDWARD W. BERRY

A few additions to the Pleistocene flora of southeastern North America are contained in the following brief notes upon two small collections of fossil plants from Alabama and Tennessee.

### ALABAMA

The following identifications are from material sent in by Dr. E. A. Smith, the State Geologist of Alabama. The plants occur in a  $3\frac{1}{2}$  foot peaty bed, underlain by white sand and overlain by about 16 feet of clay and sand, exposed in a cut on the Louisville and Nashville Railroad near Mountain Creek, Chilton County, Alabama. The lithologic character of the materials suggests a terrace deposit, and I regard the age as Pleistocene. The collection contains much coniferous wood, too decayed for generic determination, and the following named forms:

*Pinus glabra* Walt. Cones, cone axes and cone scales. This fossil occurrence is about the present northern limit of the Southern Spruce Pine, or slightly beyond, since it is rare north of the Central Prairie region of Alabama. In its wider range it is found from South Carolina to Louisiana.